

AMENDMENT TRANSMITTAL LETTERDocket No.
M4065.0226/P226Application No.
09/484,437

Filing Date

January 18, 2000

Examiner
J. Mitchell

Group Art Unit

2822

Applicant(s): Tongbi Jian

NOV 06 2001

Invention: DIE ATTACH CIRCUIT BOARD METHOD FOR BGA PRODUCT

TO THE COMMISSIONER FOR PATENTS

Transmitted herewith is an amendment in the above-identified application.

The fee has been calculated and is transmitted as shown below.

CLAIMS AS AMENDED					
	Claims Remaining After Amendment	Highest Number Previously Paid	Number Extra Claims Present	Rate	
Total Claims	32	- 30 =	2	x 18.00	36.00
Independent Claims	3	- 3 =		x	0.00
Multiple Dependent Claims (check if applicable) <input type="checkbox"/>					
Other fee (please specify):					
TOTAL ADDITIONAL FEE FOR THIS AMENDMENT:					36.00

 Large Entity Small Entity No additional fee is required for this amendment. Please charge Deposit Account No. _____ in the amount of \$ _____

A duplicate copy of this sheet is enclosed.

 A check in the amount of \$ 36.00 to cover the filing fee is enclosed. The Commissioner is hereby authorized to charge and credit Deposit Account No. 04-1073 as described below. A duplicate copy of this sheet is enclosed. Credit any overpayment. Charge any additional filing or application processing fees required under 37 CFR 1.16 and 1.17.
William E. Powell, III

Attorney Reg. No.: 39,803

Dated: November 6, 2001

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PATENT
Docket No.: M4065.0226/P226

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Tongbi JIANG

Serial No.: 09/484,437

Group Art Unit: 2822

Filed: January 18, 2000

Examiner: J. Mitchell

For: DIE ATTACH CURE METHOD
FOR SEMICONDUCTOR DEVICE

Commissioner for Patents
Washington, D.C. 20231

AMENDMENT

Dear Sir:

Responsive to the Office action dated September 25, 2001, please amend the
above-identified application as follows:

Rewrite claims 1, 3, 12 and 13 and add new claims 31 and 32 as follows:

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D. Scott
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a1

1. (Amended) A semiconductor device comprising:
a solder mask;
a die; and
an adhesive layer between said die and said solder mask, wherein said adhesive layer comprises a material that remains voidless after outgassing from said solder mask.

a2

3. (Amended) The semiconductor device of claim 1, wherein said adhesive layer is fully cured at a temperature below about 100°C.

a3

12. (Amended) A semiconductor device comprising:
a solder mask;
a die;
electrical contacts on said solder mask and said die, each said contact on said die being wire bonded to a respective said contact on said mask, said electrical contacts being devoid of contamination caused by outgassing from said solder mask; and
an adhesive layer affixing said die to said solder mask.

13. (Amended) The semiconductor device of claim 12, wherein said adhesive layer is at least partially cured at a temperature below about 100°C.

add a4

31. (New) The semiconductor device of claim 1, wherein said adhesive layer is at least partially cured at a temperature below about 100°C.

*at
concl*

32. (New) The semiconductor device of claim 12, wherein said adhesive layer is cured at a temperature between about 20°C and about 50°C higher than a glassy temperature of said adhesive layer and said curing temperature is below about 100°C.

REMARKS

A Request for Drawings Change is being filed concurrently herewith.

Claims 1-30 are currently pending in the above-identified application. Claims 21-30 have been withdrawn from consideration. Claims 1-20 have been rejected. Claims 1-5 and 12-15 have been amended. Applicant respectfully requests reconsideration in light of the foregoing amendments and following remarks.

The Office action states that Figure 1 should include a legend indicating that it illustrates a conventional object. A Request for Drawings Change is being filed concurrently herewith requesting that the legend "Prior Art" be included in Figure 1. Applicant respectfully solicits approval of the Request for Drawings Change.

Claims 1-6, 9-16, 19 and 20 stand rejected under 35 U.S.C. §103 as being unpatentable over the admitted prior art. Applicant respectfully traverses the rejection.

Claims 1-6 and 9-11 recite a semiconductor device that includes "a solder mask", "a die", and "an adhesive layer between said die and said solder mask, wherein said adhesive layer comprises a material that remains voidless after outgassing from said solder mask". Claims 12-16, 19 and 20 recite a semiconductor device including "a solder mask", "a die", "electrical contacts on said solder mask and said die, each said contact on said die being wire bonded to a respective said contact on said mask, said electrical contacts being devoid of contamination caused by outgassing from said solder mask", and "an adhesive layer affixing said die to said solder mask".

The "admitted prior art" relied upon by the Office action is a conventionally fabricated semiconductor device 10 that includes a die 12 affixed to a solder mask 18

through an adhesive layer 14. As further described in the Background of the Invention portion of the specification of the present application, conventional fabrication methods include curing the adhesive material with the solder mask through a high temperature cure. Such a cure serves to drive the low temperature volatile components out of the solder mask, leaving higher temperature volatiles to outgas at a later time during operation when the operating temperature reaches a sufficient outgassing temperature. Conventional cure times and temperatures are insufficient to cure the adhesive material, and thus later outgassing causes voids to be formed in the adhesive material. Further, later outgassing leads to contamination of electrical contacts, thereby decreasing the likelihood of a good bond therebetween.

Thus, the “admitted prior art” fails to teach or suggest “an adhesive layer between said die and said solder mask, wherein said adhesive layer comprises a material that remains voidless after outgassing from said solder mask” as recited in claims 1-6, 9-16, 19 and 20. Further, the “admitted prior art” fails to teach or suggest “electrical contacts on said solder mask and said die, each said contact on said die being wire bonded to a respective said contact on said mask, said electrical contacts being devoid of contamination caused by outgassing from said solder mask” as recited in claims 12-16, 19 and 20. On the contrary, the “admitted prior art” specifically states that voids and contaminated electrical contacts are characteristic of adhesive material which is subjected to conventional curing methods.

Claims 7, 8, 17 and 18 stand rejected under 35 U.S.C. §103 as being unpatentable over the admitted prior art in view of Dershem et al. Applicant respectfully traverses the rejection.

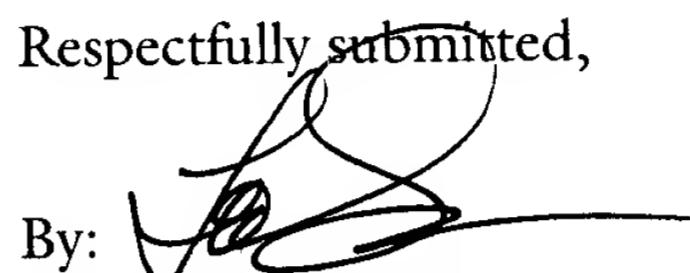
Applicant submits that Dershem et al. adds no pertinent disclosure to the “admitted prior art”. Specifically, Dershem et al. fails to teach or suggest “an adhesive layer between said die and said solder mask, wherein said adhesive layer comprises a material that remains voidless after outgassing from said solder mask” as recited in claims 7 and 8 and “electrical contacts on said solder mask and said die, each said contact on said die being wire bonded to a respective said contact on said mask, said electrical contacts being devoid of contamination caused by outgassing from said solder mask” as recited in claims 17 and 18.

Claims 3 and 13 have been amended to address typographical errors. New claims 31 and 32 have been added. No new matter has been added and the new claims are fully supported by the specification as originally filed.

For at least the reasons provided above, applicant believes that each of the presently pending claims is in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Dated: November 5, 2001

Respectfully submitted,

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